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Editorial: Special Issue: Safety & Efficiency of Civil Aviation: Selected Papers from the World Conferences of the Air Transport Research Society and the World Conference on Transport Society - 2013

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EDITORIAL

SPECIAL ISSUE: SAFETY & EFFICIENCY OF CIVIL AVIATION

SELECTED PAPERS FROM THE WORLD CONFERENCES OF THE AIR TRANSPORT RESEARCH SOCIETY AND THE WORLD CONFERENCE ON TRANSPORT SOCIETY - 2013

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The Air Transport Research Society (ATRS) is a Special Interest Group (SIG) of the World Conference on Transport Research Society (WCTRS). The ATRS annual World Conference was held at the University of Bergamo, Bergamo, Italy on 26-29 June 2013 and it attracted 266 papers from 37 countries. Also, the WCTRS triennial World Conference was held on 15-18 July at Rio de Janeiro, Brazil, during which the ATRS organised several sessions devoted to air transport topics. This special issue of the *Journal of Air Transport Studies* has drawn upon all of this material to present four papers that promote improvements in the safety and efficiency of civil aviation.

The first paper focuses attention on incidents and fatalities attributed to human factors in light aviation where unpressurised and unacclimatised aircraft cabins present pilots with a variety of environmental conditions. **Luís Patrão, Sara Zorro, André Marques, Ana Coelho and Jorge Silva** shed light on the subject with their investigation into the influence of flight environmental conditions and the pilot's psychophysiological parameters on performance. They devised a way to analyse pilot response under different flight situations while taking account of everyday habits. Specifically, they built a portable, ergonomic monitoring system which recorded cerebral oximetry and atmospheric pressure so that they could test the influence of altitude on the pilot's physiological response in different stages of the flight. This method should be of interest to other researchers studying human factors and aviation safety, particularly since the authors were able to document the link between physiological reactions such as hypoxia and stress and the pilot's cognitive response, while also accounting for environmental conditions. Safety regulators are well aware of the the importance of flight physiology in commercial and

military aviation, but this paper demonstrates that the concept should also is applicable for pilots who fly in unpressurised and unacclimatised aircraft cabins as is the case with gliders, ultralights and light aircraft.

Further valuable insights into aviation safety are provided in the second paper by **Alex Y. L. Lu and Cheng-Hua Yang**. They examined the mandatory use of Ground Proximity Warning Systems (GPWSs) (or Enhanced GPWS, EGPWS) and asked whether the use of this technology delivered an improvement in preventing controlled flight into terrain (CFIT). The authors observed that, in the 1970s, aircraft cockpits began to be equipped with various electromechanical systems to provide pilots with information about fuel systems, radios, radar, engine control, and radio navigation. These were followed with artificial warning devices that tested whether systems were functioning properly such as GPWS which was designed to warn pilots when an aircraft approaches terrain in an abnormal manner. Modernisation of these systems in current generation aircraft has resulted in greater reliance on computer automated systems, but at the same time this has made it more important for pilots to learn how to interpret the computer data to avoid perception gaps during data interpretation. In this context, it is reasonable to question whether the increasing complexity of the technology results in improved safety. The authors had access to 30 years of data recording human fatalities and have shown that safety performance improved after the mandatory installation of GPWSs in commercial aircraft. But an important finding was that most CFIT accidents now involve general aviation aircraft which are not required to have GPWS/EGPWS installed on board. Another important finding is that CFIT remains a significant risk in developing countries.

The third paper by **J. Bryan Burrows-McElwain, I.K. Dabipi and Chris Hartman** focuses on emerging tools in aviation weather information dissemination. Of particular interest is the phenomena of increased/improved pilot decision-making due to additional visual representation of visual weather data. The authors point out that one of the leading causes of fatal accidents in the aviation industry over the past two decades can be traced to underlying psychological factors that result in poor decisions made by pilots in deteriorating weather. Prior research on the topic has suffered limitations because of the lack of a theoretical framework. A satisfactory understanding of the causes and consequences of the decision of a pilot to fly VFR into Instrument Meteorological Conditions (IMC) requires examination of the various stages of decision making along with factors that affect these processes. The authors review general concepts such as past and present flight planning tools and procedures and then they conducted a pilot study to evaluate whether the Federal Aviation Administration's (FAA) Alaskan Weather Camera program would be a useful case study to test these concepts. The findings arising out of this work will be of value to researchers, policy makers and regulators who are interested in quantifying improved

decision-making and situational awareness in relation to aviation weather information dissemination.

In the final paper, **Kadriye Yaman, Hakan Oktal and Metin Altan** highlight the challenges that growth in air traffic is posing for air traffic controllers. Failure to increase handling capacity in line with demand results in congestion and hence delays, and these can lead to safety breaches with respect to minimum aircraft separation. They examine the case of Turkey where the growth in traffic has been particularly rapid and where there is an increasing risk of system bottlenecks, indirect routing, and lack of navigation freedom for airlines. The contribution of this paper is to show how GIS enables strategic planners to analyse structural features and capacity of airspace. Specifically, the authors digitized the map of Turkish airspace containing sector boundaries, routes and waypoints and, in doing so, made it possible to conduct efficient analyses in a GIS environment. They demonstrate the utility of the approach with traffic data of Turkish airspace for a period of two peak hours in heavy traffic during August 2007. The authors' analyses indicate that the traffic density of Turkish airspace is accumulative, especially in certain sectors, and this provided some specific solutions to capacity problems. This capability will no doubt be of interest to operational managers, but the more general conclusion is that the GIS environment greatly facilitates strategic planning of airspace.

The World Conferences held in 2013 were immensely successful and we, the editors, take this opportunity to thank the many people who organised these events and to the authors and participants whose active participation greatly promoted the cause of research. We are particularly grateful to those authors who continued to develop their material after the conference as well as to the expert reviewers who, acting anonymously, provided valuable, constructive advice. As a result we have been able to assemble a set of papers for this special issue that document current research on safety and efficiency of civil aviation. We are confident that this special issue will encourage further research on these subjects, but the papers offer valuable insights that will be of interest to practitioners in industry and government. We commend them to you.

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